Title: Evaluation of native and adapted plants for landscape use

Authors: Dr. Stephen Love, Horticulturist, University of Idaho
Thomas Salaiz, Support Scientist, University of Idaho
Aberdeen R & E Center, 1693 S 2700 W, Aberdeen, ID 83210;
(208-397-4181); slove@uidaho.edu

Abstract

The objective of this research is to develop and release native plant materials for use in water-conserving home landscapes, particularly new varieties of trees, shrubs, perennials, and ornamental grasses. Seed of two outstanding accessions (*Agastache urticifolia* and *Ericameria nauseosa*) were allocated to native plant nurseries within the state. Intensive evaluations and observations were made on second year plantings with inferior individuals being discarded. Superior species and individuals were retained. Plants with horticultural value were identified and seed collected from plots for further selection activities. New plantings were established in the field at the Aberdeen R & E Center using seed collected in 2006. Observations were made on newly established species concerning ease of establishment and first season horticultural value. New native plant collections were made on Idaho public lands and additional seed purchased from reputable intermountain collectors.

Objectives

This project was guided by two major objectives:

1) Identify native and adapted perennial, shrub, and tree species for use in traditional and water-conserving landscapes through collection and evaluation activities.
2) Develop and release new landscape-worthy plant cultivars for use by the Idaho nursery industry.

The ultimate goal is to develop unique plant materials that will attract new consumers and help make local landscape nurseries more competitive and profitable. This report details the second year of research accomplishments on this project.

Accomplishments

Commercial Distribution of Plant Materials

In the fall of 2007, seed of two superior plant accessions were shared with native plant nurseries. This is the first of what will hopefully become many distributions of new plant material. This allocation is not considered a release, but rather an industry evaluation activity. Cultivar releases will follow if any of these or subsequent plant selections prove market-worthy. Seed of these plants will also be sent to the Idaho and Sawtooth botanical gardens for public evaluations. The two allocated selections are:

Ericameria nauseosa #RB3: a form of rubber rabbitbrush with unique coloration and form. It was originally collected within the Snake River plain about 20 miles west of Aberdeen, Idaho. The leaves are silver-blue rather than the more common gray-green. The plants maintain a compact, mounded form and the flowering stems express limited lengthening, giving the flower clusters an embedded appearance. The overall result is a pleasing rounded form and bright color that is very attractive throughout the summer and fall. This plant provides season-long beauty in the dry garden.

Agastache urticifolia #GH63: This is a form of the native giant hyssop with exceptional flowering habit. It was originally collected near Grand Targhee Ski Resort about 10 miles east of Driggs, Idaho. The plants bloom over a 2 to 3 month period in early to mid-summer. The flower spikes have dark purple-red bracts and are up to 8 inches long, resulting in exceptionally beautiful specimens from among this common wildflower.

Evaluation of Second-Year Plants

Methods:

Extensive evaluations were completed on 1.5 acres of plant materials established during the spring of 2006. These plots had gone through one winter season, providing opportunity for observation on hardiness, adaptation, and mature appearance. Two difficult environmental factors were imposed on these plants. First, they were planted in a moderately heavy silt-loam soil with a high pH (8.2). Also, during the summer of 2007, these established plots were irrigated with 30% of evapotranspiration (ET) for Kentucky

bluegrass turf in SE Idaho. These conditions provided opportunity for selecting plants that can thrive in southern Idaho water-conserving gardens.

Throughout the 2007 growing season, observations were recorded on plant vigor, mature size, flowering habit, and horticultural value. A selection process was adopted wherein inferior plants were removed and superior plants retained within each plot. Plants were rogued if they showed excessive winter injury, weakened growth due to lack of adaptation, poor flowering characteristics, or other inferior horticultural traits. Superior plants were left in the plots in preparation for a third year of observation. In some cases seed was collected for the purpose of initiating a second cycle of selection within the best accessions.

Second-year evaluation plots at the Aberdeen R & E Center

Results

The only tree species established in plots in 2006 was bigtooth maple (*Acer grandidentatum*). The few established trees survived the winter well but produced limited growth during the summer of 2007. Several shrub species were planted and observed, but only two showed horticultural potential (Table 1). Giant purple sage (*Salvia pachyphylla*) was surprisingly hardy and attractive. Two populations of this plant not only survived the winter, but turned out to be arguably the most beautiful flowering shrubs in the trials. They produced eye-catching blue-purple flowers from early summer until hard frost. Desert fernbush (*Chamaebatiaria millefolium*) was another attractive accession. The single population evaluated was variable in growth and flowering characteristics, but many of these plants had dense form and very large flower clusters.

Salvia pachyphylla in September

Forty-three accessions of native grasses, representing 19 species, were evaluated in 2007.

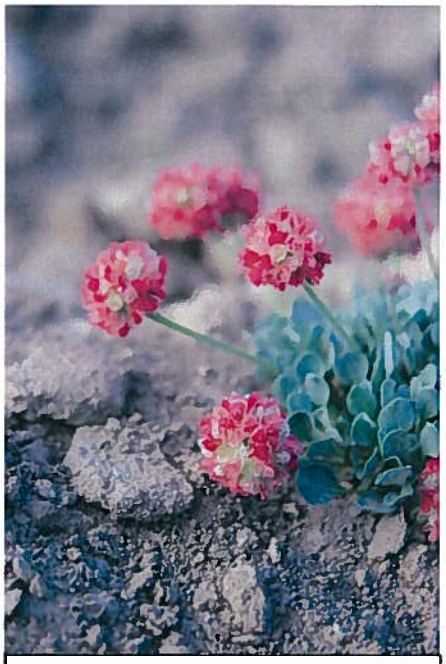
7 foot tall *Sporobolus wrightii*

Most were well-adapted to local conditions, but a few did not survive the winter. Selected plants of seven species showed very good horticultural pontential (Table 1). Indian ricegrass (*Oryzopsis hymenoides*) exhibited an attractive airy appearance and looks to be suitable for xeric conditions. Idaho fescue (*Festuca idahoensis*) populations varied widely in leaf color and form with many being very attractive. Arizona fescue (*Festuca arizonica*) showed the feathery foliage of the pony-tail grasses but had the hardiness of the Idaho fescues. Big sacaton (*Sporobolus wrightii*) was the only tall grass (7') that did well in the trials and was also quite attractive. Other grasses that combined adaptation and aesthetic value were big bluegrass (*Poa secunda* 'Sherman'), Snake River wheatgrass (*Elymus wawawaiensis*), and tufted-hair grass (*Deschampsia caespitosa*).

Penstemon pinifolius in a rock garden

Many of the perennial wildflowers and forbes demonstrated good adaptation and high levels of horticultural potential. Some of the best are described in Table 1. Genera containing the most promising accessions were *Penstemon, Clematis, Eriogonum, Agastache, and Aquilegia.* As a whole, the penstemons showed remarkable and consistent beauty. One selection of Wasatch penstemon (*Penstemon cyananthus*) was among the best of the tall species and had exceptional dark blue flower color. Pine-leaf penstemon (*Penstemon pinifolius*) formed mats of interesting linear leaves and produced bright red flowers over a long period of time. One of the superior tall specimens with red flowers was Bridge's penstemon (*Penstemon rostriflorus*). Another exception mat-forming plant with chubby blue flowers was Crandall's beardtongue (*Penstemon glabrescens*).

Mat form of *Penstemon glabrescens*

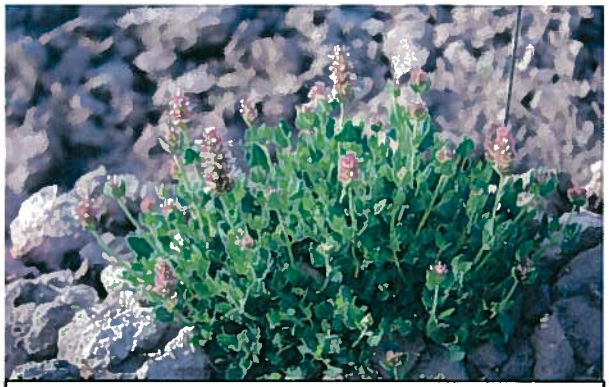


Pink *Eriogonum ovalifolium*

The native buckwheats (*Eriogonum* species) are touted as slow to establish and flower. Many of the species tested defied this stereotype, reaching attractive size and full flowering potential during the second year of growth. This genus showed amazing variability between and among species for form, appearance, flower color, growth habit size, etc., providing tremendous potential for selection of horticulturally valuable specimens. Some accessions of the Idaho native Wyeth's buckwheat (*Eriogonum heracleoides*) was very attractive with heavy flowering habit. Another native species, oval-leaf buckwheat (*Erigonum* ovalifolium) produced tight mounds of beautiful silver foliage that have remarkable rock garden potential. Other promising species include sulfur buckwheat (*Eriogonum umbellatum*), Jame's buckwheat (*Eriogonum jamesii*), bastardsage (*Eriogonum wrightii*), crispleaf buckwheat (*Eriogonum corymbosum*), and arrowleaf buckwheat (*Eriogonum compositum*).

Wiry structure of *Eriogonum corymbosum*

The mint family of plants, particularly those in the genus *Agastache*, included accessions that demonstrated the ability to bloom over long periods of time and late into the fall. *Agastache cana* and *Agastache rupestris* were exceptional for this trait. A little gem was discovered in the form of *Agastache cusickii*, a native of the mountains near Arco, Idaho with compact form, dense foliage, and long-lasting pink and white flowers.



Small mint species *Agastache cusickii*

Many other perennial wildflower accessions showed good hardiness, appropriate adaptation, and potential for use in both water-conserving and traditional landscapes. There are too many to list in this report, but descriptions of some of the best are included in Table 1.

Table 1. Native plant species expressing exceptional horticultural value in their second year of growth at the Aberdeen R & E Center.

Species	Description
Shrubs	
Salvia pachyphylla Giant purple sage	24" tall, gray-green leaves, strong fragrance, long bloom period, blue-purple flowers
Chamaebatiaria millefolium Desert fernbush	36" tall, fern-like foliage, large clusters of white flowers in early summer
Grasses	
Oryzopsis hymenoides Indian ricegrass	15" tall, very drought tolerant, airy panicles that stay attractive into early winter
Festuca idahoensis Idaho fescue	10" tall, leaf color varies from dark green to bright blue, flower spikes attractive for most of the summer
Festuca arizonica Arizona fescue	20" tall, light green leaves that are long and arching, flower spikes attractive through summer
Sporobolus wrightii Big sacaton	7' tall, attractive light green leaves, large feathery seed heads that provide nice winter interest
Poa secunda Big bluegrass	20" tall, flowers early and remains attractive through the summer, very drought tolerant
Elymus wawawaiensis Snake River wheatgrass	36" tall, open upright form, interesting horizontal flag leaves, remains attractive into winter
Deschampsia caespitosa Tufted-hair grass	Height variable, many different forms, gold-colored panicles glisten in the sunlight
Perennial Wildflowers	
Sphaeralcea caespitosa Cushion globemallow	3" tall and spreading, silver leaves, large orange flowers that last all summer, very drought tolerant
Penstemon	
cyananthus Wasatch penstemon	30" tall, spikes of intense blue flowers May-June
venustus Venus penstemon	24" tall, attractive toothed foliage, masses of pink-purple flowers in May-July.
virens Front range penstemon	10" tall, dark blue spring flowers that repeat late in the summer
ambiguous Bush penstemon	20" tall, an unusual penstemon with bush-type growth, covered with flat pink flowers
pinifolius Pineleaf penstemon	8" tall, mat forming, short spikes of bright red flowers that last most of the summer
attenuatus Sulfur penstemon	24" tall, an unusual yellow flowering penstemon that blooms May-June
barbatus Beardlip penstemon	60" tall, one of the tallest species, dark red flowers that last most of the summer, attracts hummingbirds
glabrescens Crandall's beardtongue	6" tall, forms a dense mat that is wider than tall, light blue flowers off and on all summer.
rostriflorus Bridge's penstemon	30" tall, red flowers over a long period in mid-summer

Clematis	
fruticosa Mongolian gold clematis	18" tall, shrub form of clematis with nodding dark yellow flowers (adapted but not native)
integrifolia Solitary clematis	12" tall, shrub form of clematis with star-shaped dark blue flowers (adapted but not native)
Erigonum	
heracleoides Wyeth's buckwheat	18" tall, white to buff flowers over dark green foliage, competitive with companion plants
umbellatum Sulfur buckwheat	Variable height and flower habit, some with yellow, orange or red flowers, some with repeat bloom
jamesii Jame's buckwheat	12" tall, white or yellow flowers in late summer, leaves may turn purple in fall
corymbosum Crispleaf buckwheat	24" tall, wiry stems that form a spherical mound, covered with small white flowers in fall
compositum Arrowleaf buckwheat	30" tall, one of the taller buckwheats with large deltoid leaves and big clusters of dark yellow flowers
wrightii Bastardsage	10" tall, spreading mats of gray leaves, airy recemes of light pink flowers
ovalifolium Oval-leaf buckwheat	6" tall, round mats of tightly packed silver leaves, pom-pom flowers in many colors from white to dark red
Agastache	
cusickii Cusick's hyssop	12" tall, dense growth, light green fragrant leaves, white to pink flowers for most of the summer
cana Hummingbird mint	40 " tall, small gray leaves, dark pink flowers from mid-summer to late fall, nice fragrance
rupestris Licorice mint	36" tall, small gray-green leaves, flowers orange with purple bracts, bloom from mid-summer to late fall
Aquilegia scopulorum Rocky Mountain columbine	6" tall, dark blue leaves, beautiful blue and white flowers on short stems

Many species of Indian paintbrush were evaluated in 2006-2007for growth potential in the absence of a host. Most died during transplanting in 2006, but a few small, weak plants survived that first summer in the field. Of these, many did not survive the subsequent winter. Lack of vigor appeared to be related not only to host absence, but to lack of adaptation to high soil pH conditions. A few plants of one species, *Castilleja integra*, survived into the second summer (2007) and managed to bloom. They will be observed for survival, vigor, bloom, and seed set for another year or two to determine if they can live long-term without other plants close by.

Establishment of New Accessions

Methods

Throughout the summer and fall of 2006, native plant seed was collected *in situ* or purchased from other collectors. There was a slight shift in emphasis toward evaluation of shrub species and seed of the following genera were obtained: *Atriplex,*

Symphoricarpos, Sambucus, Cornus, Amelanchier, Rhus, Rosa, Philadelphus, and *Salvia.* Preference with respect to perennial wildflower accessions changed only a little from 2005. Efforts were made to significantly expand collections of *Agastache, Aquilegia,* and *Clematis*. Other genera added for evaluation included *Monarda*, *Monardella*, *Iliamna*, *Aster*, *Erigeron*, *Hymenoxys*, *Tonestus*, *Zauschneria*, and *Papaver*. Table 2 provides a summary of plant materials accumulated for evaluation.

Table 2. Summary of 2006 seed collections that were used for 2007 plot establishment.

Genus	**Total Accessions**	**# Species Represented**	**# *In situ* Idaho Collections**
Lupinus (lupine)	39	18	23
Sphaeralcea (globemallow)	10	3	8
Iliamna (river mallow)	4	1	4
Penstemon (penstemon)	95	49	52
Castilleja (Indian paintbrush)	66	26	32
Eriogonum (buckwheat)	93	23	63
Agastache (hyssop)	17	9	7
Monarda (beebalm)	4	4	0
Monardella (pennyroyal)	12	7	2
Salvia (mint)	18	11	4
Aquilegia (columbine)	20	15	2
Aster (aster)	1	1	0
Erigeron (daisy)	22	15	0
Hymenoxys (rubberweed)	2	2	0
Papaver (poppy)	9	7	0
Zauschneria (fire chalice)	2	2	0
Atriplex (hopsage)	5	1	5
Sambucus (elderberry)	1	1	1
Cornus (dogwood)	10	1	10
Amelanchier (serviceberry)	12	4	10
Rhus (sumac)	1	1	1
Philadelphus (syringa)	1	1	1
Chamaebatiaria (desert fernbush)	2	1	2
Clematis (shrubby clematis)	15	8	1
Rosa (rose)	1	1	1
Acer (maple)	10	2	10

In January-February of 2006, seed was mixed with moist potting soil/sand, placed in Ziploc bags, and stratified for approximately two to three months at 40^0 F. Exceptions were seed of *Sphaeralcea*, and *Lupinus* that require no cold treatment for germination. In March, seed was planted in flats and allowed to germinate in a greenhouse at the Aberdeen R&E Center. When plants were 2-3 weeks old, a maximum of 40 plants from each seed lot were teased out of the flats and planted into the individual cells of cone

flats. In May, plants were transplanted to the field on the Aberdeen R&E Center. Approximately 1 acre of land was required for establishment of 2006 accessions.

Plant establishment practices were designed to mimic nursery handling procedures. The intent was to provide selection pressures that give preference to plants capable of thriving through typical production and transplanting procedures. Detailed notes were maintained on germination and survival during establishment. Weather had some impact on transplant survival of two recalcitrant genera, *Castilleja*, and *Lupinus*. Hot, dry winds caused significant plant mortality during the first two days following transplanting and reduced survival to a fraction of those placed in the field.

Transplanting native plants into the field

During and after establishment, plants were provided with limited inputs. No fertilizer was added beyond the 40 lbs/acre of nitrogen fertilizer applied in the spring of 2006. For the first two weeks after transplanting, a light irrigation was applied every other day. Subsequently, irrigations were made at levels around 30% of ET replacement for Kentucky bluegrass lawn. During the heat of the summer this was equal to biweekly applications of approximately 1 inch of water.

Following establishment, periodic assessments were made of vigor, tendency to flower during the first season, and general horticultural value. Evaluations reflected accession (meaning general notes on an entire plot) characteristics rather than individual plant traits.

Results

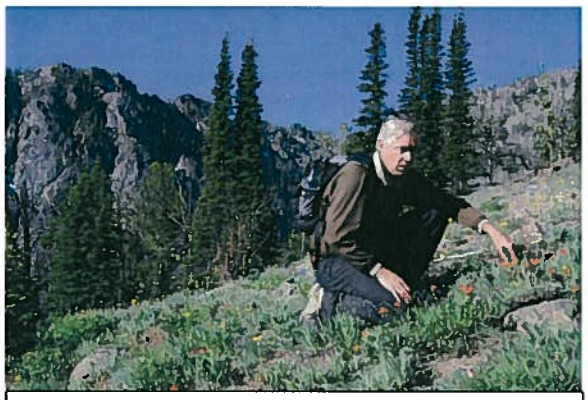
Lessons learned in the first year (2006) of propagation resulted in considerably greater establishment success in 2007. Germination in the greenhouse was generally very good and there were very few problems with damping off in germination flats. Some mortality was observed during the teasing and transplanting operations, but only with the recalcitrant genera such as *Castilleja* and *Lupinus*. In general, plants established quickly in the field and grew rapidly.

Some species showed a marked tendency to bloom during the first year of growth. The most floriferous plants were in the species *Lupinus malacophyllus, Sphaeralcea spp., Iliamna rivularis, Penstemon attenuates, Penstemon whippleanus, Penstemon smallii, Penstemon hallii, Penstemon procerus, Penstemon barrettiae, Eriogonum ovalifolium, Eriogonum strictus, Eriogonum microthecum, Eriogonum brevicaule, Eriogonum coloradense, Eriogonum kennedyi, Monarda citriodora, Monardella odoratissima, Monardella viridis, Agastache aurantiaca, Agastache barberi, Agastache scrophulariaefolia, Agastache cana, Agastache rupestris, Salvia azurea, Salvia lemmonii,*

Salvia carduacea, Salvia jurisicii, Erigeron melanocephalus, Erigeron ursinus, Erigeron clokeyi, Erigeron flettii, Erigeron pinnatisectus, Papaver alboroseum, Papaver nudicaule, Papaver alpinum, Mirabilis multiflora, Zauschneria garrettii, and *Salvia dorrii.*

2007 Plant Collection Activities

Plant genera slated for collection in 2007 were largely unchanged from 2006. The few additional targets included the shrubs within *Physocarpus, Ribes, and Holodiscus* and the perennials *Heuchera* and *Petrophyton*. Less emphasis was given to other genera, including *Lupinus* and *Sphaeralcea*. Collection activities directed at Idaho native plants were conducted at Hell's Canyon, the Seven Devils Mountains, Beaverhead Range, Black Pine Mountain, Clearwater River drainage, and the Bear River Range. Major seed purchases were made from Northwest Native Seed (Seattle, WA), Rocky Mountain Rare Plants (Franktown, CO), American Penstemon Society, and the North American Rock Garden Society. With few exceptions purchases were of plants native to the Northwest and/or the Rocky Mountains.



2007 seed collection near Seven Devils

Expenditure Report

Category	Amount Allocated	Amount Expended
Salaries, wages and fringe benefits	$8,760	$7,350
Travel for collection activities	$1,050	$1,050
Pots, trays, labels, soil mix, etc	$ 750	$ 750
Field charges, local motor pool, seed	$1,075	$1,055
Total funds allocated	$11,635	
Total expensed to date		$10,205
Amount remaining as of 29 Nov 06	$ 1,430	

(Remaining funds will be used to pay residual salaries for the year and to purchase additional seed from collectors)